Visualization of Hyperspectral Images Through Interactive Sections

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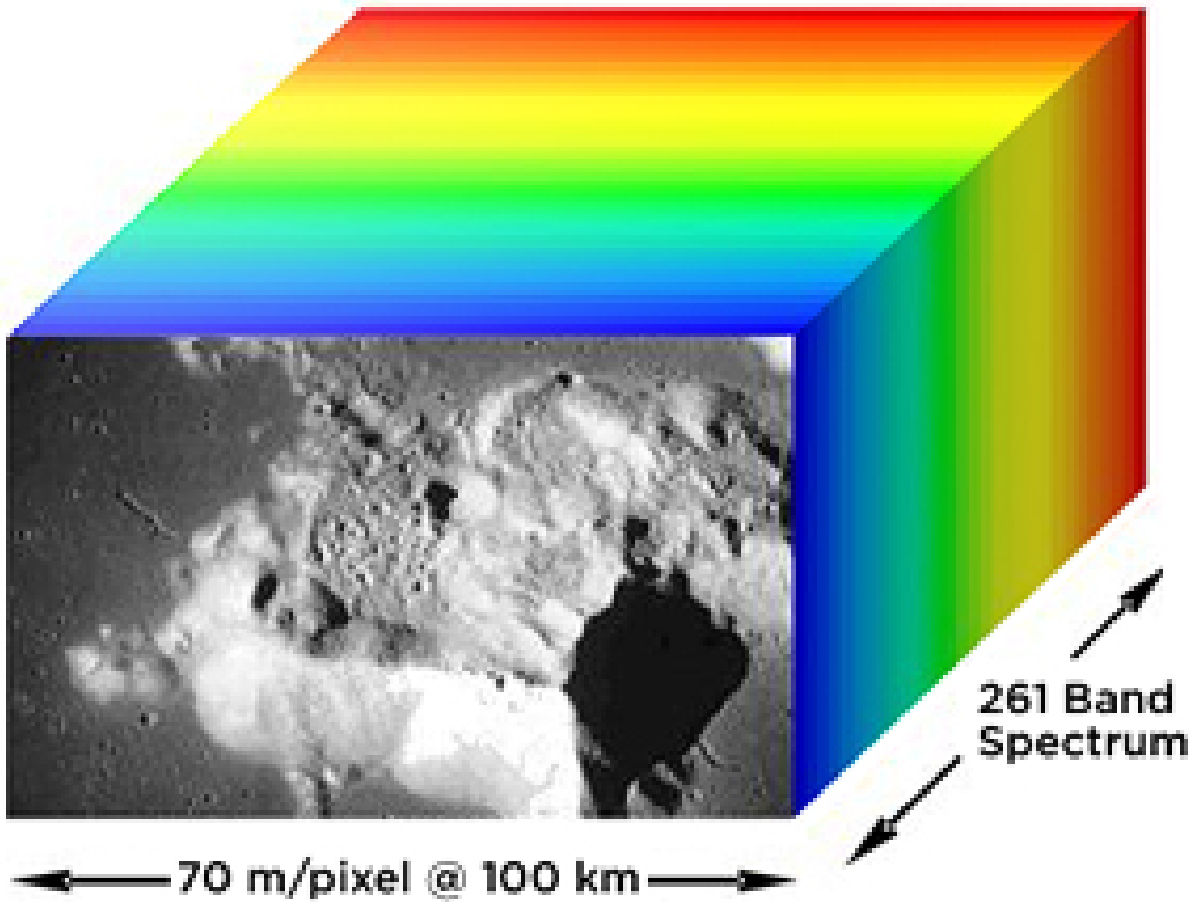
Overview

- What is a hyperspectral image?
- What are challenges of visualizing?
- What are methods of visualizing?
- What is the developed tool?
- Why use the developed tool?

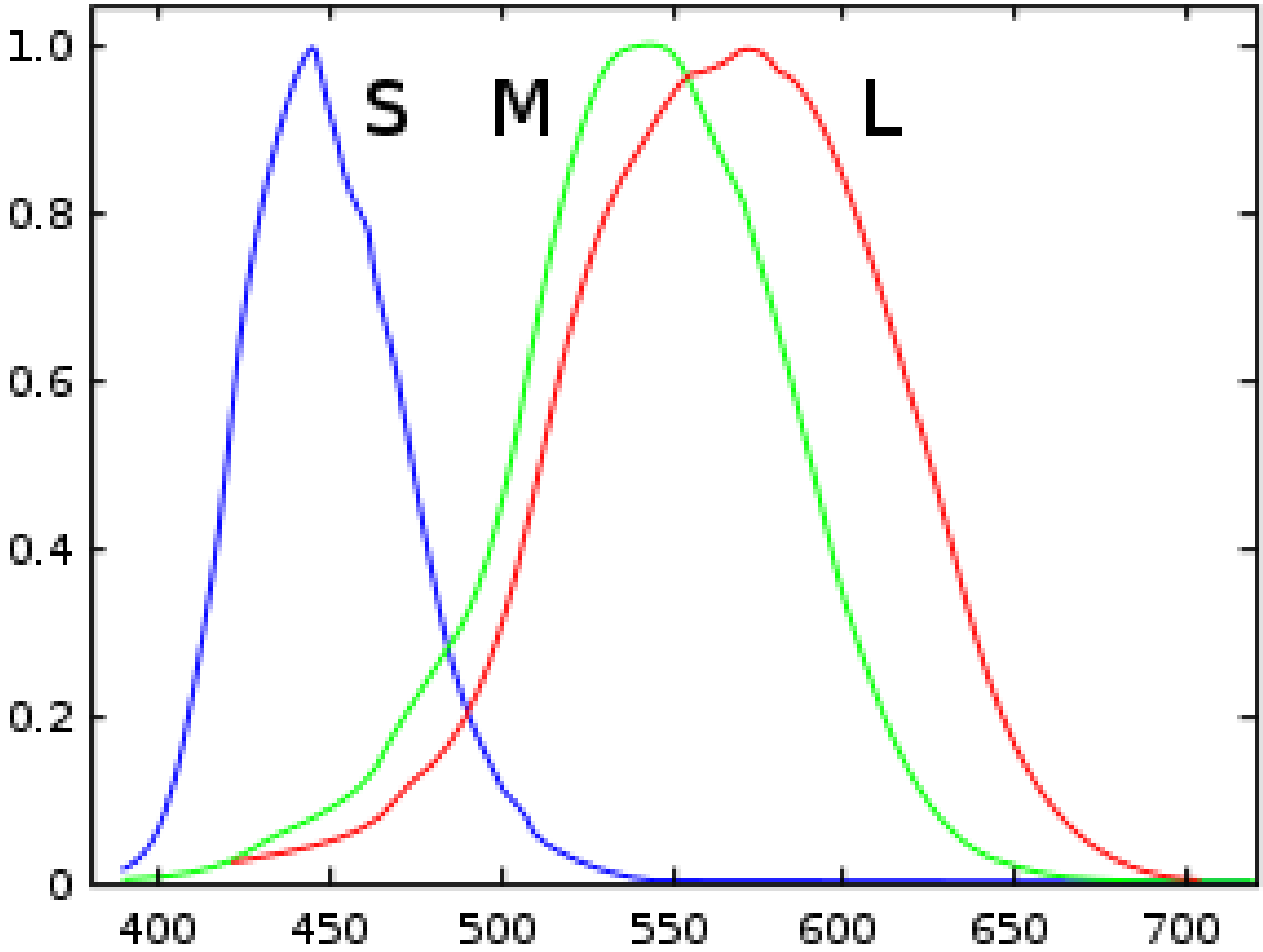
What is a hyperspectral image?



Moon Minerology Mapper: *http://m3.jpl.nasa.gov*

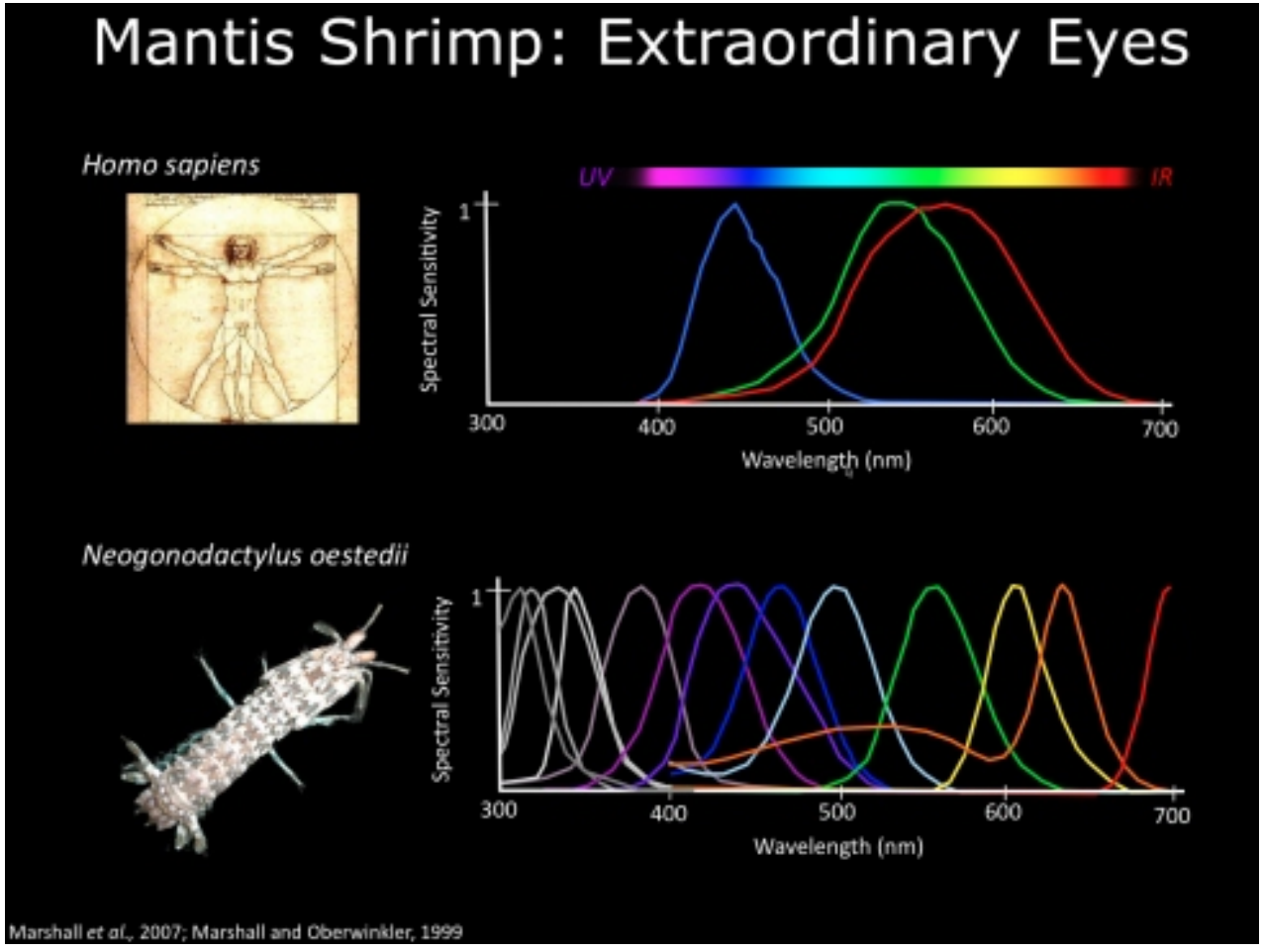
What are challenges of visualization?

Too few human photoreceptor types and too many spectral bands



What are challenges of visualization?

Having a visual system like the Mantis Shrimp would be helpful:

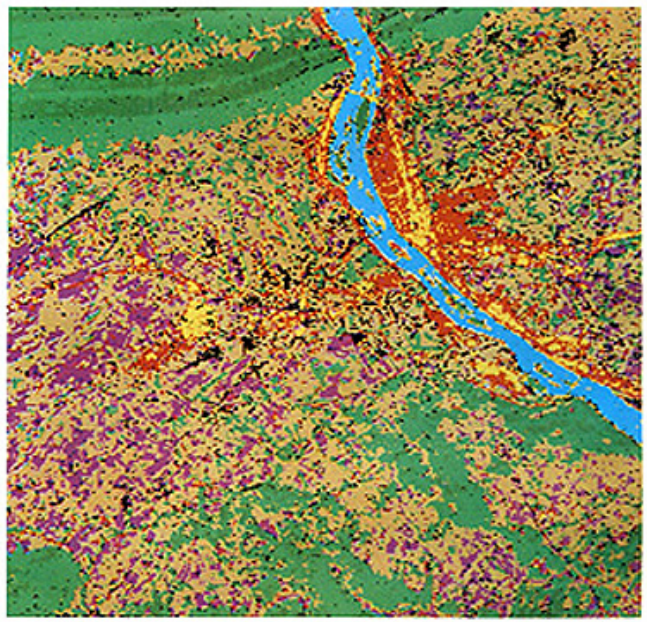


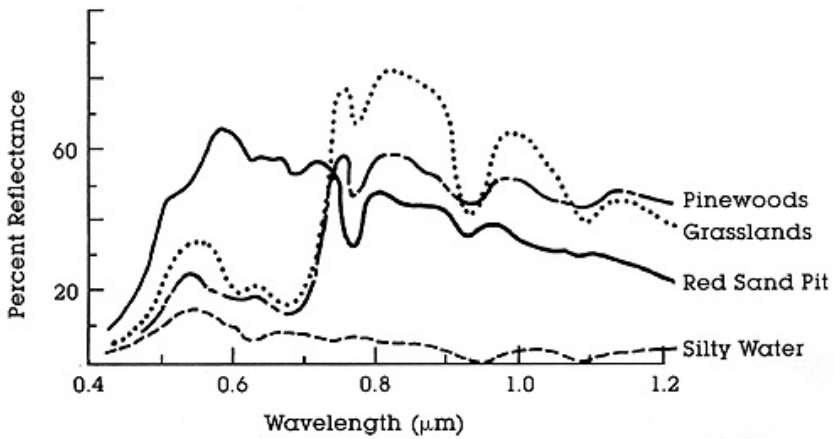
Source: Michael Bok, http://arthropoda.southernfriedscience.com

What are methods of visualization?

Spectral Dimension Reduction

- Band math
- Integration
- Decomposition



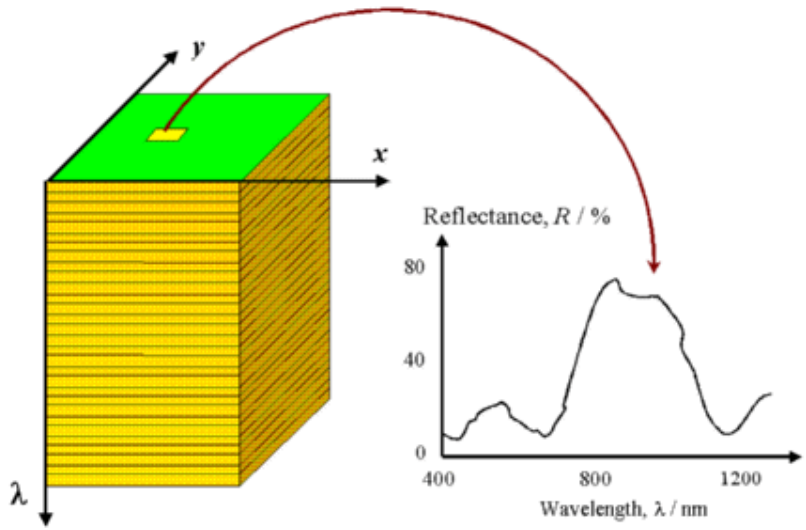


Nicholas Short's Remote Sensing Tutorial: *http://rst.gsfc.nasa.gov*

What are methods of visualization?

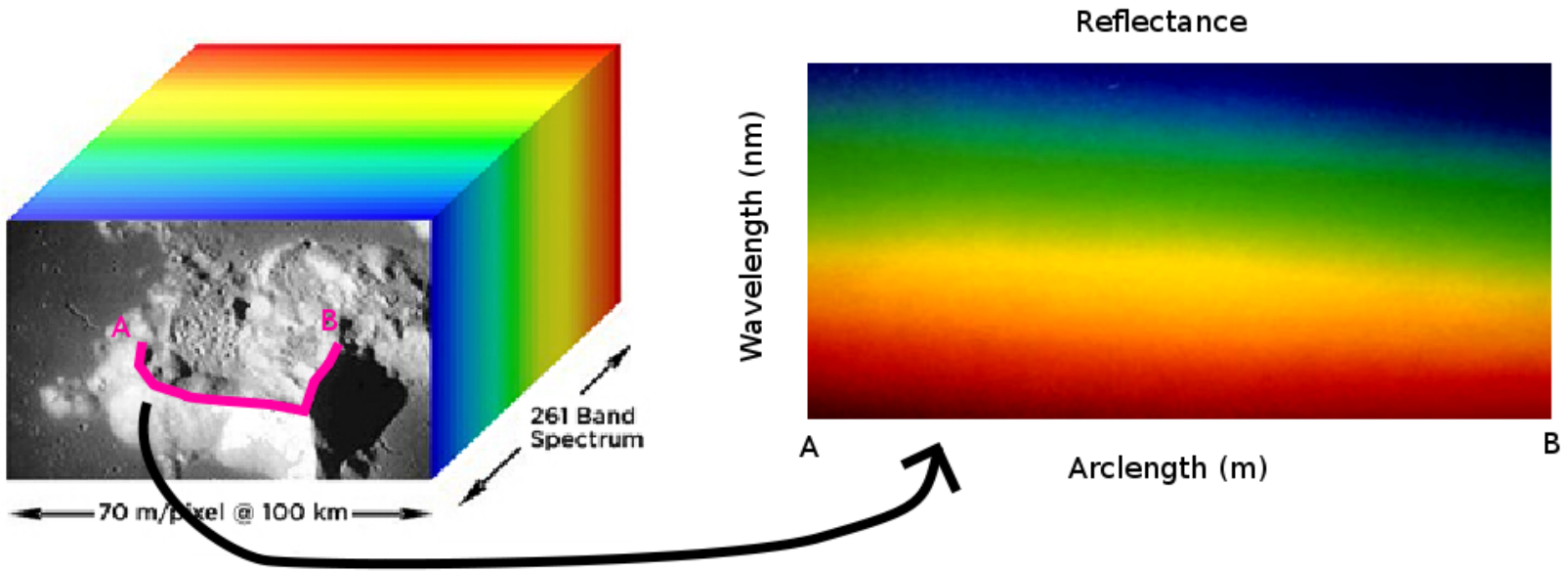
Spatial Dimension Reduction

- Point sampling and curve plotting
- Region of interest statistics and curve plotting
- Image cube rendering



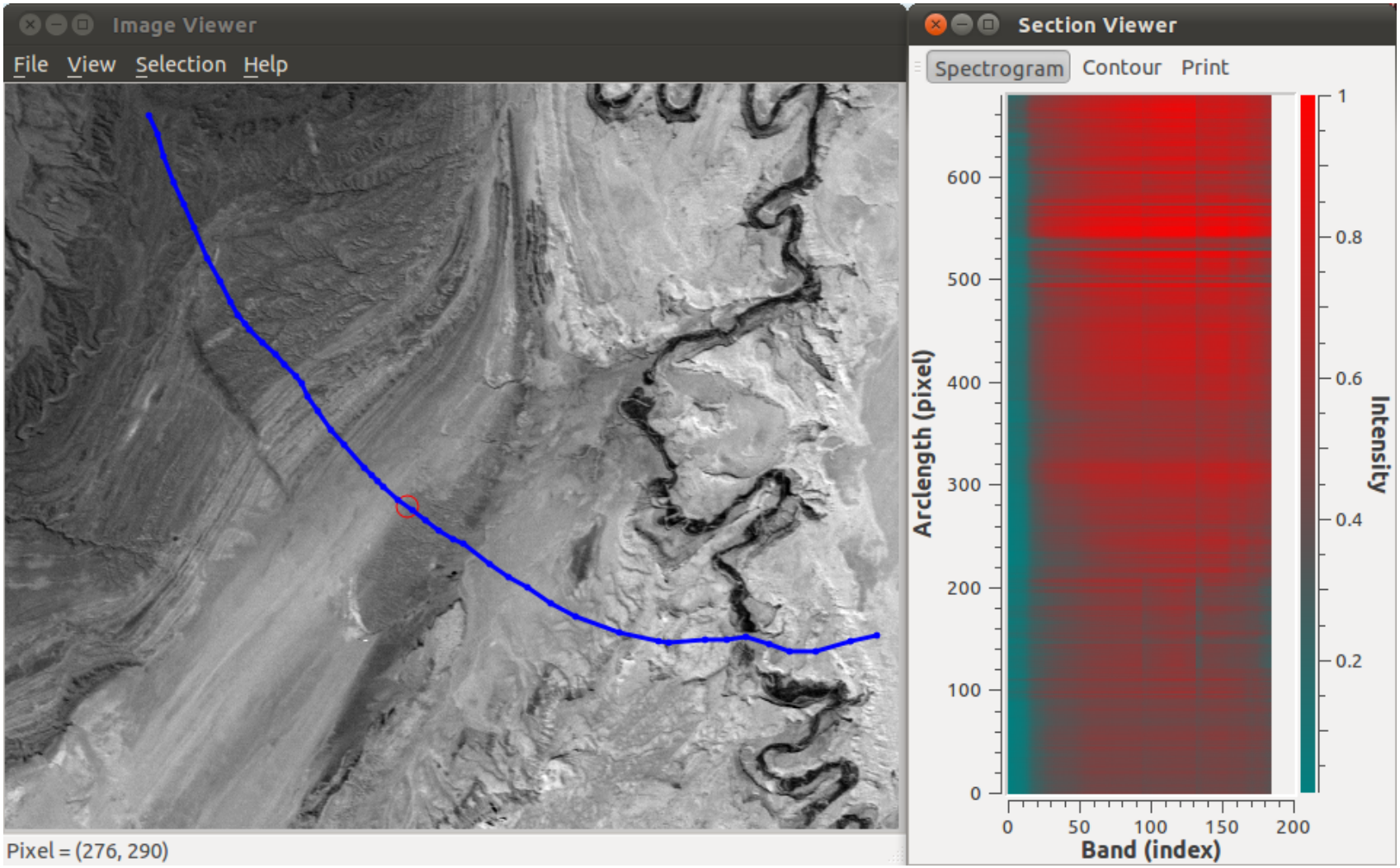
What is the developed tool?

. . . reduce spatial dimension by sampling along a user defined curve and render an image representing intensity of each band along the curve



What is the developed tool?

. . . screenshot:



What is the developed tool?

Interface

- Choose a single band to render
- Edit paths interactively
- Change colormap interval interactively
- Link points between plots
- Plot spectrum at a single point

Why use the developed tool?

Evaluation

- by Brown Geologists
- found tool generally useful
- expect to use in research
- better suited to certain situations

Why use the developed tool?

Weaknesses

- some scenes are be well characterized by a few bands, like near infrared
- high noise images aren't easy to interpret
- image rendering of spectra is not be intuitive

Why use the developed tool?

Strengths

- fills niche in toolset
- interactivity for curves and color map
- linked views between image, section and point spectrum plot
- some scenes show broad features, like the thermal infrared

Why use the developed tool?

Suggestions

- allow multiple paths
- color image relative to a reference spectrum
- use segmentation image for navigation

Take Home Message

There is no silver bullet for visualizing this data, so we need an array of tools to answer scientific questions.

Questions?

Thanks! Questions?